Process Scale-up & Capacity Enhancement

- **Scaled Up Production Volume:** Successfully scaled up the production process of **Pregabalin (Stage AMHA2)** from a 1,000 kg capacity in A-Block to a 2,000 kg capacity in C-Block, contributing to a total plant capacity increase from 18–20 TPM to 28–30 TPM.
- **Drove Throughput Growth:** Led process optimizations and capacity enhancement initiatives that successfully doubled the production of **Atorvastatin Calcium** from ~4.2 TPM to ~8.4 TPM across Blocks B & E.

Troubleshooting & Quality Optimization

- **Resolved Particle Size Specification Issues:** Successfully achieved the required Particle Size Distribution (PSD) spec (D_{50} - NLT 5 microns) for **Flecainide Acetate** by systematically reducing agitator speed from 96 to 60 RPM, modifying acetic acid dilution volumes, and implementing direct slurry processing inside the ANFD.
- **Eliminated RS Impurity Failures:** Resolved a critical out-of-specification (OOS) quality failure in the **Voxelotor (Stage VOTB1)** trial batch by identifying distillation delays and introducing a vacuum balancing system with a 10 m^2-Graphite condenser, cutting distillation times to under 44 hours to meet strict HPLC limits.
- **Optimized Reaction Conversions:** Corrected a low-yield reaction conversion issue in **Voxelotor (Stage VOTR2)** Suzuki-Coupling reaction by designing a dual PTFE nitrogen sparger system for efficient purging and installing a Solid Charging Hopper with a double butterfly valve to allow catalysts to charge safely at higher temperatures (55°C).

Based on the Technical Services Monthly Reports provided, here are achievement bullet points tailored for your resume, categorized by functional areas to help you structure your experience effectively:

Process Scale-up & Capacity Enhancement

- **Streamlined Process Workflows:** Enhanced **Ranolazine** production capacity from ~8.0 TPM to ~16.0 TPM by managing technology transfers and scaling up outputs across stages DHMP1 through DHMP4.
- **Executed Multi-Stage Scale-ups:** Orchestrated the phase-wise capacity expansion of **Rosuvastatin Calcium (RA)** from 1.7 TPM to 4.0 TPM, which included adding an advanced cleanroom facility in F-Block.

New Product Introduction (NPI) & Validations

- **Led New Product Validations:** Successfully planned and executed multiple trail and validation batches for newly introduced high-value products, including **Sucralfate**, **Istradefylline**, **Voxelotor**, **Rimegepant**, and **Sitagliptin (Enzyme Route)**.
- **Met Custom Micronization Specifications:** Directed three successive micronization trials on **Sucralfate** to successfully meet stringent customer requirements, driving down dimensions to D_{90} NMT 15 μm and achieving an SSA NLT 4.
- **Managed Technology Transfers:** Supervised the tech transfer, input/output yield analysis, and validation parameters for multiple stages of **Istradefylline** (Stages IDLE1 to IDLE4) and **Sitagliptin** (Stages SATM1 to SATM3).

Capital Project Execution & Engineering Support

- **Spearheaded Facility Creation:** Successfully established a new **6.0 KL Hydrogenation Reactor facility** in B-Block for the Atorvastatin Calcium (ATSC1 stage) and oversaw the flawless scale-up execution of batches ranging from 400 kg to 750 kg.
- **Modified Plant Utilities for Efficiency:** Improved the MDC Solvent Recovery rate in **Pantoprazole** by implementing a chilled brine circulation system for the primary condenser.
- **Upgraded Production Infrastructure:** Managed infrastructure modifications in I-Block (filtration and drying equipment) and audited/finalized raw equipment accessory and utility load requirements

(cooling tower water, chilled water, and chilled brine) for upcoming D-Block and G-Block expansions.
- **Designed Specialized Process Setups:** Engineered an **azeotropic distillation setup** for Oseltamivir Phosphate to facilitate targeted water removal, and integrated a **vacuum balancing system** for a 4 KL reactor to support the Rosuvastatin Calcium Pharma stage.

Here are impact-driven resume achievement bullet points tailored for an Engineering, Operations, or Solvent Recovery System (SRS) Management role, generated from your presentation performance data.

To maximize the impact on your resume, the points have been categorized by key engineering domains:

Process Optimization & Source Reduction

- **Led Source Reduction Initiatives:** Strategically optimized chemical processes across multiple commercial drug lines (including Clopidogrel, Rosuvastatin, and Atorvastatin), eliminating multi-lot filtration extraction steps and cutting solvent use at the source by **31,197 Liters per batch**.

- **Minimized Transfer & Distillation Losses:** Designed and implemented closed transfer lines with centrifugal pumps and vacuum controller logic to eliminate critical vacuum-sucking transfer losses in Clopidogrel and Levetiracetam production lines.

- **Engineered Utility Upgrades:** Drafted action plans for a **600TR New Cooling Tower** installation and designed dual secondary/tertiary condenser arrays utilizing chilled brine circulation to suppress high-volatility atmospheric venting losses.

Financial Performance & Cost Savings

- **Achieved Major Cost Savings:** Successfully established an in-house **96.5% pure Rosuvastatin Isopropyl Alcohol (IPA)** column recovery process, recycling **267 KL** of what was previously sold as mixed waste to generate a direct cost savings of **₹2.67 Crores**.

- **Optimized Fresh Solvent Procurement:** Drove a massive optimization trend that cut average monthly fresh solvent consumption by **40%** (reducing procurement from an average of 5.3 Cr to 3.5 Cr per period), yielding multi-million-dollar cost-efficiency gains.

- **Captured Multi-Crore Recycled Value:** Managed an advanced 4-column Solvent Recovery System (SRS) unit that yielded a cumulative

6,900 MT of recovered output with a net recycled chemical valuation of **₹35.40 Crores**.

Waste Management & Sustainability

- **Advanced Multi-Component Azeotropic Separations:** Successfully executed complex Batch Column Distillation trials using water entrainers to resolve hard-to-separate *Acetone + Methylene Chloride (MDC)* fractions, achieving **98.5% MDC purity and 98% Acetone purity**.

- **Implemented Zero-Waste In-House Recycling:** Spearheaded a zero-job-work recycling model that safely collected, isolated, and recovered complex mixed-spent chemicals internally from **12 distinct external business and manufacturing units** (including Oncology, Pharma Chem, and Maithri Labs).

- **Boosted Plant Recycle Percentages:** Systematically moved factory operations toward a sustainable **25% Fresh to 75% Recovered Fluid (RFS)** production target mix, heavily lowering the corporate environmental footprint.

Project Management, Commissioning & Validation

- **Headed Capital Expansion (CAPEX) Projects:** Managed mechanical installation and column commissioning works for dual **750mm diameter distillation column systems** including tank-farm storage expansion.

Here are high-impact, results-oriented resume achievement points tailored for a **Process Engineer** or **Project Engineer** role, derived from the solvent recovery plant project and upgrade presentation data:
New Solvent Recovery Plant Installation & Commissioning (LS-3)

- **Led Large-Scale Facility Installation:** Spearheaded the engineering, layout planning, and structural design coordination for a new multi-column Solvent Recovery System (SRS) featuring dual Ø750 mm (21.3m height) and dual Ø900 mm (21.6m height) packed distillation columns utilizing high-efficiency FXpack 7.5 L structured packing.

- **Designed Advanced Piping & Layout Infrastructure:** Engineered comprehensive plant utility/transfer line architectures, establishing dedicated solvent transferring networks from production blocks directly to the SRS tank pad area to eliminate operational bottlenecks.

- **Spearheaded Process Optimization & Capacity Scale-up:** Systematically scaled up SRS column productivity by **105%** (moving from a baseline of 390 KL to a monthly throughput of 801 KL) by optimizing column thermal dynamics and increasing boil-up rates from 3,000 L/hr to 4,500 L/hr, significantly reducing batch cycle times.

- **Transitioned System to Continuous Distillation:** Drove the engineering proposal and design translation from legacy batch distillation columns to an automated, continuous top & bottom collection recovery process, expanding spent handling capability from 200 KL/month to over 500 KL/month.

Existing Facility Upgrade & Retrofitting (ZEN Plant Expansion)

- **Orchestrated Major Capacity Expansion Project:** Engineered the process modification and brownfield upgrade plans to scale the ZEN Distillation plant's output by **250%**, boosting cumulative recovery capacity from 400 KL/month up to a target of 1,400 KL/month.

- **Debottlenecked Distillation Hardware:** Optimized column thermal mass and residence times by strategically re-rating and retrofitting low-capacity reactors/kettles with 20 KL heavy-duty distillation kettles across multiple Ø600 mm and Ø900 mm column arrays (Columns #04, #05, #09, and #10).

- **Upgraded Industrial Utility & Cooling Systems:** Supervised critical system maintenance and overhaul plans for large-scale cooling utilities, including the descaling and line-cleaning of dual 250 TR and single 660 TR cooling tower setups to maximize condenser efficiency across 10 active distillation rows.

- **Implemented Safety Automation & Risk Mitigation:** Oversaw comprehensive facility safety integration plans, introducing steam interlocking loops, column vent connections directly routed to dump tanks, reboiler safety relief valves (SRVs), and dedicated double-earthing interconnectivity across the entire distillation line.

- **Enhanced Material Transfer Infrastructure:** Eliminated contamination risks by upgrading the facility infrastructure from flexible HDPE pipes to dedicated stainless steel flexible hose assemblies (3-meter runs) for standardized, safe tanker loading/unloading operations.

Based on the presentation material provided, here are the key achievements and proposed upgrades regarding the solvent recovery improvement system at APL Unit V:

Strategic Objectives & Retrofitting Achievements

- **System Upgrades:** Successfully initiated the replacement of aging Bubble Cap Packing with high-efficiency Structured Packing for the Solvent Recovery System at the Regulatory Area (specifically for Columns DIE001, DIE002, and DIE003).
- **Addressing Efficiency Losses:** Identified and resolved significant capacity drop-offs caused by 15 years of corrosion on the bubble cap trays, which previously prevented the system from meeting its target quantity and quality metrics.
- **Capacity Expansion:** Completed design metrics to retroactively scale the total boil-up rate from the existing **1350–1500 LPH** up to approximately **2300 LPH**.
- **Infrastructure Optimization:** Upgraded the primary condenser infrastructure from older models to a higher-capacity **40+12 m² box-type condenser** to support the increased boil-up rates.

Technical Performance Achievements (Packed vs. Tray Towers)

The transition to a Packed Tower system yielded major chemical processing advantages:

- **Enhanced Surface Area:** Achieved a highly dense surface area of **500 m^2/m^3** (for the 500Y model), drastically increasing the Number of Theoretical Stages per Meter (NTSM) to ensure maximum distillate purity within the same column height.
- **Reduced Pressure Drop:** Lowered the gas-pressure drop across the system, effectively allowing a decrease in the required operating height of the columns.
- **Minimized Liquid Hold-Up:** Realized a much smaller liquid hold-up, a critical feature for obtaining sharp chemical separations during batch distillation processes.
- **Improved Foaming Management:** Optimized the column dynamics to operate with far less gas bubbling through the liquid, making the system vastly superior for handling foaming chemical mixtures.

Process & Quality Milestones

The system met strict quality control targets for vital industrial solvents:

- **Ethyl Acetate (All Products):** Processed a batch size of 4500 Liters utilizing a specialized $CaCl_2$ treatment to successfully drive moisture content (M.C.) **below 1.0%**.
- **Acetonitrile:** Processed a batch size of 5000 Liters via atmospheric distillation and $CaCl_2$ treatment to reduce moisture content **below 2.0%**.
- **Isopropyl Alcohol (DIE003):** Managed a 5000-Liter batch with precise pH adjustment (to 8.0–8.5 using a NaOH solution) to perfectly align with production block process requirements.

Based on the technical data and performance metrics provided, here is a collection of high-impact Process Engineer resume achievement statements. They are categorized by core focus areas and use strong action verbs paired with quantifiable metrics to maximize resume appeal.

Process Optimization & Yield Enhancement

- **Optimized API Yields:** Spearheaded process intensification and optimization initiatives, driving scalable product yields toward the 85%+ industry benchmark across multi-conversion synthesis lines.
- **Commercial Scaling Improvements:** Successfully scaled up critical products (including Belumosudil, Pantoprazole, and Rosuvastatin Calcium), enhancing Pantoprazole capacity from 4.5 to 6.5 MT and Rosuvastatin from 7.8 to 9.5 MT without requiring major capital investments.
- **Process Cycle Time Reduction:** Redesigned a core condensation and cyclization reaction sequence to completely eliminate distillation and co-distillation steps, reducing batch cycle time from 40–42 hours to 35 hours while cutting operational costs.
- **Crystallization & Transfer Efficiency:** Overcame a 4–5 kg historical product loss in Etifoxine crystallization by altering crystallization volumes (4.64V) and expanding pump suction lines from 25 NB to 40 NB, reducing product transfer time to under 5 minutes.

Predictive Scale-Up & Simulation

- **Advanced Mixing Simulations:** Utilized **MIXIT** simulation software to model shear rate distributions and macro/micromixing time profiles,

ensuring identical power-per-unit-volume performance when scaling up from kilo-lab to plant-scale reactors.

- **Crystallization Modeling:** Modeled a critical crystallization stage for Isavocanazonium Sulfate to manage %occupancy and limit volatile organic compounds (Acetonitrile) to $<200\text{ PPM}$, successfully matching kilo-lab quality limits prior to full-scale plant execution.

- **Data-Driven DoE Implementation:** Transitions development workflows from traditional One-Factor-at-a-Time (OFAT) methodologies to robust **Design of Experiments (DoE)** matrices, successfully isolating parameters that achieve $>98\%$ target purity.

Cost Reduction & Solvent Recovery

- **Capital Expense (CapEx) Savings:** Generated an annualized savings of **47.15 Lacs** by mapping the heat load of water ring vacuum pumps and water ejectors onto an existing 200TR cooling tower system, eliminating the need for new utility hardware purchases.

- **Solvent Recovery System Redesign:** Designed and proposed a modified continuous distillation column featuring automatic safety interlocks and downcomer/thermosyphon facilities, successfully scaling spent solvent handling from 150–200 KL/month to 300–500 KL/month.

- **Strategic Solvent Reductions:** Led Bill of Materials (BOM) auditing and updates in production planning software (SAP), reducing solvent charges at source (including savings of up to 2,500 L/batch of critical solvents) to drive an aggregate annual savings of **11.3 Cr**.

- **Aqueous Waste Stripping:** Pioneered an in-house solvent stripping operation utilizing a 5 KL reactor system, reducing high-COD aqueous effluent from 600,000 ppm to under 50,000 ppm while extracting 15–20% of reusable organic solvents from waste streams.

Process Safety & EHS Excellence

- **Thermal Risk Analysis:** Implemented reaction calorimetry setups (**RC1e**) to define operating boundaries and map adiabatic temperature spikes (ΔT_{ad}), successfully identifying Stoessel Criticality Indexes (Class 1 to Class 3) for exothermic additions.

- **Hazardous Material Containment:** Engineered a closed-loop double-valve hopper system with positive nitrogen blanketing ($200\ text{ mmwc}$) and integrated breather valves/flame arresters to eliminate dust-cloud hazards and air exposure during fine powder ($44\ \ mu\text{m}$) charging.

- **Engineering Noise Abatement:** Diagnosed and mitigated severe sound pollution risks in engineering workspaces by redesigning a nitrogen compressor exhaust silencer line, expanding the vent size from 3” to 6” to successfully lower velocity and damp reflective noise.

⚙ Equipment Selection & Unit Operations

- **Filtration Equipment Standardization:** Formulated a standardized rule system for scaling up filtration operations by analyzing specific cake resistance (α), filtration flux thresholds ($>20\text{ LPM/m}^2$), and pocket filter data.
- **Drying Cycle Optimization:** Conducted multi-scale Vacuum Tray Dryer (VTD) evaluations, successfully establishing baseline tray depth parameters ($\sim 5\text{ mm}$) and temperature controls to hit tight limits of Loss on Drying ($\text{LOD} \le 0.17\%$) across a 12-hour drying loop.
- **New Tech Evaluation:** Spearheaded the evaluation and deployment of cutting-edge processing technology, including corrugated heat exchangers, automated inline pH sensors with protective U-seals, and wet-mill homogenizers for precise particle size distribution (PSD) target controls.

Based on the technical data provided regarding process optimization, trails, and validation batches for **Sparsentan (SPN)**, here is a structured list of high-impact achievements tailored for a Process Engineer’s resume.

You can categorize these under a **"Key Achievements"** or **"Professional Experience"** section.

Technical & Process Engineering Achievements

Process Optimization & Impurity Control

- **Impurity Mitigation:** Successfully minimized critical quality defects—including Isomer, dimer, and post-dimer impurities—during the scale-up of a modified 4-stage Sparsentan (SPN) process.
- **Critical Parameter Definition:** Engineered a strategic process shift by establishing a strict reaction mass addition protocol into an Ethanolic HCl solution with a highly controlled assay range of **10% to 20%**.
- **Innovative Material Troubleshooting:** Introduced and managed the implementation of unlisted raw materials (Molecular Sieves across

multiple 30kg lots) as a process aid to drive yield consistency and control reactionary variabilities.

Validation & Scale-Up Execution

- **NPI (New Product Introduction):** Spearheaded the process engineering and trail validation workflow for the **2025–2026 New Product List** at the LS-III facility.
- **Flawless Batch Execution:** Successfully executed multiple full-scale validation batches for early Drug Master File (DMF) stages (SPAN1 & SPAN2) with zero recorded process observations, fully adhering to Master Batch Production Records (BPR).
- **Root Cause Analysis (RCA):** Systematically isolated, documented, and resolved complex process variabilities across a 4-stage DMF manufacturing cycle, reducing active processing issues to just two final stages (SPAN3 & SPAN4).
- **Yield & Quality Enhancement:** Spearheaded root cause investigations into reaction variabilities for NPIs at the LS-III facility; designed an optimized Ethanolic HCl solution assay parameter (**10%–20%**) that effectively suppressed Isomer and dimer impurities.
- **Change Control & Troubleshooting:** Authored technical justifications for the deployment of a 60kg molecular sieve drying protocol to control moisture-driven side reactions during critical synthesis stages, ensuring regulatory compliance and batch uniformity.

Quick Tips for Your Resume:

1. **Contextualize the Scale:** If you remember the exact batch sizes (e.g., in kilograms or liters) beyond the 30kg molecular sieve lots, add them to make the points even more concrete.
2. **Action Verbs:** Start each bullet point with strong verbs like *Spearheaded, Engineered, Suppressed, Isolated,* or *Validated*.

Would you like me to help draft a specific summary or cover letter paragraph integrating these exact achievements?

Here is a comprehensive list of high-impact resume achievement bullet points extracted from the provided presentations. They are categorized by professional focus areas so you can easily select the ones that best fit your specific job role (e.g., Process Engineer, Project Manager, or Operations Lead).

Process Optimization & Efficiency Gains

- **Optimized Solvent Recovery Outputs:** Successfully spearheaded process enhancement initiatives that significantly scaled up recovery outputs across core industrial solvents: increased Methanol recovery from 53 KL to 125 KL , boosted Isopropyl Alcohol (IPA) recovery from 53 KL to 93 KL , and elevated Dichloromethane (DCM) recovery from 124 KL to 151 KL.
- **Reduced Solvent Loss Gaps:** Formulated and implemented a strategic solvent management framework that effectively decreased the plant-wide material gap from 36% (11,566 KL) down to a proposed 29% (9,008 KL).
- **Enhanced Total Recovery Percentage:** Engineered a large-scale recycling strategy to scale overall plant solvent recovery from 35.55% (10,387 KL) to a projected 47.26% (13,816 KL), substantially reducing dependency on fresh chemical procurement.
- **Executed Zero-Investment Operations (Phase-01):** Spearheaded immediate operational improvements requiring zero capital investment to eliminate 80 Tons Per Month (TPM) of solvent waste. This was achieved by diverting 30% of aqueous mixed streams (55 TPM) and de-scaling condensers to mitigate vent losses by 10% (20 TPM).
- **Standardized Production Parameters:** Established strict operational standards to maximize low-boiling solvent containment, including stabilizing vacuum applications to Not More Than (NMT) 300 mmHg for DCM and MTBE , executing routine cooling tower blowdowns , and flashing mixed streams before Effluent Treatment Plant (ETP) routing.

Financial Impact, Cost Savings & ROI

- **Delivered Strategic Cost Savings:** Developed a comprehensive ₹20 Crores capital expenditure (CAPEX) initiative that achieved a net cost reduction of ~₹1.2 Crores per month. This was driven by successfully lowering fresh solvent consumption by ~310 KL per month , delivering a complete Return on Investment (ROI) within a rapid 16-month payback period.
- **Managed High-Return Engineering Upgrades:** Designed and justified a ₹4.0 to ₹5.0 Crores facility modification project targeting a 2% reduction in input solvent volume (~630 MT/Year). This initiative secured ₹3.8 Crores in annualized savings with an expected payback period of under 2.0 years.
- **Implemented Advanced Utility Upgrades:** Championed a ₹0.7 Crores utility conversion project to integrate a -50°C brine/chiller system in place of dry ice operations. This upgrade optimized distilled chemical consumption and generated direct net savings of ₹2.5 Lakhs per month.

- **Designed Asset-Recovery Systems (Acetone):** Conceptualized and implemented a ₹2.15 Crores cleaning-solvent segregation system across 15 blocks. This installation captured a 50% reusable solvent yield against a 60 KL input, realizing full project payback within a 1.0-year timeline.

- **Designed Asset-Recovery Systems (Methanol):** Formulated a ₹3.65 Crores technical plan to segregate cleaning Methanol from spent streams across 15 blocks. The project established a 50% reuse capacity against a 100 KL input, resulting in a predictable 2.0-year ROI.

Project Management & Engineering Leadership

- **Designed Major Capital Expenditures (Phase-02 CAPEX):** Spearheaded the engineering design and planning for a ₹23 Crores permanent aqueous stream treatment facility. The blueprint featured 5 large-scale reactors (up to 20 KL Stainless Steel / MSGL) , integrated Thermosyphon re-boilers with 10-meter packed vapor columns , and Pressure Swing Adsorption (PSA) technology.

- **Installed Process Engineering Safety & Controls:** Managed the cross-functional deployment of automated infrastructure upgrades across 50 systems. Key installations included Nitrogen (N_2) blanketing systems , automated utility lines , breather valves , vacuum controllers across 10 units , and high-efficiency vent condensers for catch pots to minimize vapor escape.

- **Pioneered Clean-In-Place (PoC) Technologies:** Directed a ₹0.8 Crores Proof of Concept (PoC) project implementing automated Clean-In-Place (CIP) spray balls and nozzles across 2 reactor blocks. This initiative successfully targeted a 10% to 15% reduction in cleaning solvent volumes, saving 120 to 180 KL annually.

- **Mitigated In-House Storage & Process Losses:** Identified, mapped, and audited cross-contamination and environmental escape points across fresh, distilled, and spent storage facilities. This resulted in a comprehensive mitigation roadmap addressing a baseline loss of 11,363 MT per year.

Here is a comprehensive list of high-impact resume achievement bullet points extracted from the newly attached presentations. They are tailored to emphasize process scale-up, engineering modifications, cost optimization, and regulatory compliance.

Capacity Expansion & Production Scale-Up

- **Production Rate Optimization:** Accelerated monthly throughput across primary product lines, driving demonstrated capacity expansions for Tapentadol Hydrochloride from 4.5 TPM to 15 TPM , Atomoxetine Hydrochloride from 0.5 TPM to 4 TPM , and scaling Topiramate capacity toward a target of 10 TPM.

- **Large-Scale Batch Scaling:** Capitalized on a newly commissioned block facility consisting of 8KL and 10KL Glass-Lined (GLR) and Stainless Steel (SSR) reactors to successfully boost Tapentadol Intermediate Stage-01 batch sizes from 300 Kg to 800 Kg, and Stage-02 batch sizes from 790 Kg to ~2,400 Kg.

- **Process Flow Bottleneck Removal:** Enhanced Atomoxetine HCl production from 2 Tons to 8.3 Tons by applying strategic batch-size scale-ups and integrating a high-throughput decanter system during workup stages.

- **Throughput Optimization Planning:** Spearheaded the multi-product plant optimization planning to transition Clopidogrel Bisulfate to a 10 TPM capacity and Ticagrelor to a 5 TPM baseline capacity.

Process Engineering & Operational Efficiency

- **Semi-Automation Control Upgrades:** Engineered a semi-automated temperature and distillation control system by introducing automated steam control valves on core reactors, reducing cycle times by 50% for heating (down to 2 hours) and by 44% for distillation (down to 5 hours), which delivered an annualized asset cost saving of ₹3,12,828.

- **Grignard Reaction Optimization:** Overhauled utility flow configurations on Grignard reactors by installing automated flow control valves tied to RTD sensor feedback loops; cut chemical addition cycle times in half (from ~48 hours to ~24 hours) while completely preventing raw material vapor escape to save ₹10,86,210 annually.

- **Vapor Loss Reduction:** Redesigned reactor feeding architecture with a specialized deep blow leg for M-500 chemical additions, bypassing previous vapor losses and improving conversion metrics.

- **Transfer Pipeline Engineering:** Streamlined plant fluid mechanics by deploying dedicated 2" transfer lines across multiple Grignard units, successfully shrinking mass quenching times by 62% (from ~8 hours to ~3 hours).

- **Electrical & Asset Reliability Improvements:** Implemented a 60 KVA UPS system covering three critical resolution reactors to eliminate process tripping and downtime, resulting in a lean equipment layout that freed up a 10KL reactor for alternative manufacturing lines.

- **Agitation Mechanism Re-Engineering:** Replaced traditional propeller agitators with advanced Curved Blade Retreat Turbine (CBRT) agitators during Etifoxine crystallization; completely eliminated solvent entrapment below the strict 410 ppm limit, removing the need for product reprocessing while shortening cycle times.

- **Distillation Cycle-Time Reductions:** Achieved a 5-to-6-hour reduction in Ethyl Acetate distillation batch cycle times by introducing an auxiliary heat exchanger driven by chilled brine utilities.

Cost Optimization & Solvent Recovery (Financial Impact)

- **In-Process Solvent Circularity:** Structured an in-process Toluene distillate reuse protocol for Tapentadol HCl lines that secured direct cost reductions of ₹42,700 per batch (yielding ₹10.2 Lakhs saved monthly across 24 batches) while mitigating vendor shortages for other products.

- **High-Yield Waste Minimization:** Championed an in-house Toluene recycling campaign for Pioglitazone Stage-1, returning an impressive financial benefit of ₹2 Lakhs per batch and pacing a monthly savings run-rate of ₹20 Lakhs.

- **Raw Material Substitution:** Substituted fresh chemical consumption with Recycled (RFS) Cyclohexane during the Ticagrelor technical process stage, decreasing raw material expenditure by ₹32,300 per batch and ₹3.2 Lakhs per month.

- **Vacuum System Optimization Savings:** Supervised facility vacuum controller deployments for Topiramate Stage-1 Acetone collection, reducing waste overheads to claim ₹10,000 per batch and ₹1.0 Lakh in monthly savings.

- **Condenser Utility Modifications:** Initiated condenser utility modifications on Ticagrelor production lines to boost Chloroform solvent recovery by 100% (from 400L to 800L per batch), capturing a continuous cost benefit of ₹15,000 monthly.

Product Validation, Quality Control & Safety

- **Environmental & Ambient Factor Control:** Directed the plant-level production scale-up of Tapinarof API to safely deliver 11.38 kg (generating ₹1.52 Crores in revenue) by configuring rental dehumidification hardware to keep relative humidity below 40%, and deploying a triple-Nutsche filtration methodology to ensure full PXRD compliance.

- **Industrial Fume & Hazard Management:** Enhanced plant containment and safety by leading the installation of acid-resistant fume chambers, Air-Operated Double Diaphragm (AODD) pumping loops, and specialized "reverse umbrella" centrifuge attachments connected directly to gas scrubbing architectures.

Here is a professional list of resume achievement bullet points extracted from your Technical Services Department (TSD) and Process Engineering presentations. The points are designed with strong action verbs and exact data metrics, categorized by core engineering domains.

Process Engineering & Scale-Up Optimization

- **Advanced Mixing Simulation Modeling:** Deployed predictive scale-up mixing simulation software to establish equivalence and mixing profiles during product scale-up from kilo-lab to commercial reactors. Optimized the hydrogenation stage parameters for Belumosudil, successfully cutting reaction cycle times from 4 hours down to 30 minutes while reducing critical amino deboc impurities from 0.66% to 0.18%.

- **Critical Crystallization Scale-Up:** Modeled complex crystallization parameters for the ISVS4 stage of Isavuconazonium Sulfate to optimize vessel occupancy metrics. Successfully stripped Acetonitrile down to strict ICH guidelines (Not More Than 410 PPM) while preventing the formation of product-degrading alcohol impurities caused by over-drying.

- **Process Intensification & Cycle-Time Reduction:** Engineered a major process optimization for Lercanidipine HCl by adjustment of stoichiometric volumes. Completely bypassed a challenging, high-temperature distillation and co-distillation of a high-boiling material (156°C), which significantly minimized impurity formation and reduced overall batch cycle times.

- **Standardized Filtration Flux Assessment:** Established a rigorous engineering baseline requiring a filtration flux of greater than 20 LPM/m^2 across all new processes. Utilized specialized pocket-filter scale-up studies to determine correct commercial equipment selection, eliminating solvent entrapment, product contamination, and poor cake washability.

Solvent Recovery, Sustainability & Cost Management

- **Infrastructure Modernization & Throughput Expansion:** Spearheaded the technological transition from traditional batch recovery columns to an automated continuous top and bottom collection system. Expanded the plant’s spent solvent handling capacity from a maximum of 200 KL/month to between 300 and 500 KL/month while lowering utility overheads and shortening batch cycle times.

- **Plant-Wide Solvent Loss Auditing:** Supervised the solvent management and recovery program for the Rudraram MSNL-1 facility, governing an annual solvent procurement baseline of 21,600 KL valued at ₹168 Crores. Implemented targeted technical interventions to minimize a 29% baseline material loss, introducing solvent-stripping

systems to reduce effluent COD and updating SAP Bills of Material (BOM) with actual plant consumption metrics.

- **Cross-Contamination Prevention Framework:** Designed and deployed a dedicated solvent stream segregation framework across multiple active production blocks. This operational enhancement successfully prevented the mixing of distinct chemical spent streams, directly boosting the purity and reusability of recovered distillates.

Process Safety, EHS & Hazard Mitigation

- **Hazardous Raw Material Closed Charging:** Redesigned the process architecture for introducing Manganese Dioxide into Methanol media during Etifoxine cyclization to eliminate open manhole exposure and severe dust cloud hazards. Engineered a completely sealed double-valve charging loop integrated with a breather valve and flame arrester to maintain a continuous 200 mmwc positive nitrogen blanketing environment.

- **Thermal Flashpoint Mitigation:** Overhauled processing constraints to lower Manganese Dioxide raw material addition temperatures from 30–35°C down to below 10°C, ensuring all charging operations executed safely beneath the 11°C flashpoint of Methanol solvent.

- **Reaction Calorimetry Risk Analysis:** Institutionalized the systematic application of Reaction Calorimetry (RC) and powder characteristic evaluations to identify hidden thermal risks during early development. Evaluated adiabatic temperature rises and thermal accumulation factors on critical stages (including Tapinarof dimethylation and sensitive nitration steps) to determine precise Stoessel Criticality Index classifications and guarantee built-in plant safety.

Strategic Operations & Capacity Release

- **Volumetric Capacity Delivery:** Directed operational and technical initiatives to fulfill high-level annual TSD goals, successfully capturing an explicit 10% to 11% expansion and release in total plant asset capacity measured via Total KL Days.

- **Operational Excellence & Waste Reduction:** Maintained a continuous 10% absolute reduction in plant effluent mass output while driving the successful plant-scale deployment of two novel cost-optimization manufacturing technologies.